These elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, or section without departing from the teachings of example embodiments.

[0041] Spatially relative terms, such as "beneath," "below," "lower," "above," "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the ten "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0042] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of example embodiments. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises", "comprising", "includes" and/or "including," if used herein, specify the presence of stated features, integers, steps, operations, elements and/or components, hut do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components and/or groups thereof. Expressions such as "at least one of" when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list.

[0043] Example embodiments are described herein with reference to cross-sectional illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of example embodiments. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, example embodiments should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. For example, an etched region or an implanted region illustrated as a rectangle may have rounded or curved features. Thus, the regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of example embodiments.

[0044] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which example embodiments belong. It will be further understood that terms, such as those defined in commonly-used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0045] Although corresponding plan views and/or perspective views of some cross-sectional view(s) may not be shown, the cross-sectional view(s) of device structures illustrated herein provide support for a plurality of device structures that extend along two different directions as would be illustrated in a plan view, and/or in three different directions as would be illustrated in a perspective view. The two different directions may or may not be orthogonal to each other. The three different directions may include a third direction that may be orthogonal to the two different directions. The plurality of device structures may be integrated in a same electronic device. For example, when a device structure (e.g., a memory cell structure or a transistor structure) is illustrated in a cross-sectional view, an electronic device may include a plurality of the device structures (e.g., memory cell structures or transistor structures), as would be illustrated by a plan view of the electronic device. The plurality of device structures may be arranged in an array and/or in a two-dimensional pattern.

[0046] Exemplary embodiments of aspects of the present inventive concepts explained and illustrated herein include their complementary counterparts. The same reference numerals or the same reference designators denote the same elements throughout the specification.

[0047] FIG. **1** is a diagram schematically illustrating a substrate treatment apparatus according to some example embodiments of the inventive concepts.

[0048] Referring to FIG. **1**, a substrate treatment apparatus **1** may include one or more of a process chamber **100**, a supplying unit **200** (also referred to a gas supply assembly **200**), an exhaust unit **300** (also referred to as a gas exhaust assembly **300**), an injection unit **400** (also referred to as a gas injector assembly **400**), and a control unit **500** (also referred to as a gas injection control device **500**).

[0049] The process chamber **100** may include an internal space that is isolated from the outside and is configured to perform a process on a substrate S. The substrate S may be disposed in the process chamber **100**, and the process chamber **100** may be configured to allow the substrate S to be treated under vacuum condition. The process chamber **100** may include an electrostatic chuck **110**, a shower head **120**, a first electrode **130**, a second electrode **140**, and a chamber pressure sensor **150**. The electrostatic chuck **110** may be disposed at a lower region of the process chamber **100**. The electrostatic chuck **110** may be configured to hold or fasten the substrate S. The shower head **120** may be disposed at an upper region of the process chamber **100**. The shower head **120** may be configured to inject a process gas supplied from the supplying unit **200** into the process chamber **100**. The first electrode **130** may be disposed in the electrostatic chuck **110**, and the second electrode **140** may be disposed in the shower head **120**. However, the positions of the first and second electrodes **130** and **140** may not be limited thereto. As an example, both of the first and second electrodes **130** and **140** may be disposed in the lower region of the process chamber **100**. Radio frequency (RF) power may be applied to at least one of the first and second electrodes **130** and **140**. The RF power may be used to induce a plasma reaction from the process gas to be supplied into the process chamber **100**. The chamber pressure sensor **150** may be configured to measure an internal pressure of the process chamber **100**. The data of internal pressure measured by the chamber pressure sensor **150** may be transmitted to the control unit **500**.